Some notes on medically important flies (Diptera: Calliphoridae) from India

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Abstract

Many cases of myiasis are reported every year from India, but in most of these cases the correct identification of fly maggots is lacking. Moreover, calliphorids and other families of Diptera like Sarcophagidae, Muscidae are vectors of number of diseases like cholera, poliomyelitis, typhoid fever, leprosy, tuberculosis etc. Keeping in view the medical importance of these flies, an attempt is made to enlist the calliphorid species from India.

Keywords: *Myiasis, Calliphoridae, India.*

Introduction

Myiasis is usually dealt with from the stand point of tissues and organs invaded, and classified under rhinal, aural, oral, ocular, cutaneous, subcutaneous, vaginal and gastro-intestinal myiasis. This method of dealing with the subject is not only unscientific but leads to endless confusion, as the same larva may be found in more than one organ and in wounds and cuts of all kinds. As to mention, the larvae of *Chrysomya bezziana*, the old world screw-worm fly may be found in all the above named cavities and in all forms of cutaneous and subcutaneous myiasis. The subject of myiasis should be best studied from the standpoint of the flies themselves, which may be classified as follows:

Obligatory (Specific myiasis producing flies): Include those species which lay their eggs or deposit their larvae in the living tissues.

Facultative (Semi-specific myiasis producing flies): Include species which normally lay their eggs or deposit their larvae in decomposing animal or vegetable matter, but occasionally place them in living tissue.

Accidental myiasis producing flies: Include those species which normally lay their eggs or larvae in stale or decomposing vegetable matter. Many human food stuffs are suitable breeding ground for these flies, and if these are not properly protected, washed or cooked, become infected and the larvae are accidentally ingested, and are able to live in the intestines.

Many cases of myiasis have also been reported from India (Bapat, 2000; Mahipal *et*

al., 2002; Sehgal *et al.*, 2002) but in most of these cases the correct identification of the fly maggots is lacking. Long lists of names of flies are given in the books of medicine, but no mention is made as to how the various larvae of Indian species could be identified. For this reason very little effort is made by medical practitioner to rear the larval forms into adults.

Apart from causing myiasis, the flies belonging to families Calliphoridae, Sarcophagidae and Muscidae are vectors/ transmitters of diseases like poliomyelitis, cholera, typhoid fever, bacillary dysentery, trachoma virus, enteric infections, leprosy, tuberculosis, etc.(Patton, 1922; Zumpt, 1965; Greenberg, 1971,1973).

Keeping in view the medical importance of these flies, an attempt is made to enlist the calliphorid species.

Results and Discussion

Morphology of the larvae

A calliphorid larva is generally identified and distinguished from other dipteran larvae on the basis of following characters:

A typical calliphorid larva has twelve segments; one cephalic, three thoracic and eight abdominal segments (Fig.1a).

The second segment bears an anterior spiracle on either side in second and third instar. It is a fan shaped multi-lobed respiratory structure which represents the sclerotized anterior end of the large tracheal branch (Keilin, 1944). The number of lobes is of systematic use as each species posses a limited range; for e.g. *Calliphora vomitoria* possesses 9-12 lobes in the third instar where as *Calliphora vicina* larvae possess 5-8 lobes(Fig.1b).

The first and second larval segments together contain the cephalopharyngeal skeleton. The following nine segments show few distinguishing features other than the arrangement of spines. The twelfth segment, however, shows several features of taxonomic interest, the most important being the posterior spiracle. In the first instar these are simple, kidney shaped structures, whereas in the second and third instars the spiracle consist of an outer heavily sclerotized ring, the peritreme, which surrounds the spiracular apertures. In the second instar the peritreme is incomplete at the ventral end and there are two apertures. In the third instar the peritreme is complete and a button is present at the ventral end, which represents the ecdysial scar of the second instar spiracle (Kurahashi, 1985). Three apertures are present in the third instar (Fig.1c).

In addition, there are present the four foci of a 'sun-ray' structure; these are presumed to strengthen the spiracle. Spiracle distance factor (SDF) is of utmost value in distinguishing larvae at species level. It is calculated by dividing the distance between the spiracles by the greatest diameter of one spiracle.

Last segment also possesses seven pairs of papillae on its posterior surface (numbered P1 to P7). The position of P2 in relation to P1 and P3 is of taxonomic value(Fig.1d).

Currently no identification key to immature stages of Indian calliphorids is available, so the above mentioned diagnostic characters will help the medical practitioner to distinguish the calliphorid larva from other dipteran larvae.

Notes on Indian Calliphorids

***Chrysomya megacephala* (Fabricius, 1794)**

Musca megacephala: Fab., 1794,Syst. Ent.,4:317

Chrysomya megacephala: Seguy, 1928, Encycl.Ent.,B II Dipt.,4:101

Chrysomya megacephala: James, 1977:542.

Type locality: Guinea

Distribution: Pantropical, widespread in Oriental region: India, Nepal, Thailand, Malaysia, Indonesia (Java,Maluku,Timor); widespread in Australian and Oceanian region.

Bionomics:

This fly is a common scavenger in India(Bharti & Singh,2003) and sometimes produces myiasis of man and domestic animals (Bakar *et al.*,1983). Adults are generally found on garbage and are attracted to decaying meat and human excrement. It could be found at an elevation of up to 2200m (Senior White *et al.*, 1940; Kurahashi&Thapa, 1994; Sukontason *et al.*, 2006).

***Chrysomya rufifacies* (Macquart,1843)**

Lucilia rufifacies: Macquart, 1843:303(146). Type locality: Nouvelle-Hollande [Australia]
Lucilia orientalis: Macquart, 1843:302(145). Type locality:Pondicherry,India
Lucilia pavonina: Schiner, 1868:305. Type locality: Kar Nicobar and Tellnschong
Somomyia barbata: Bigot, 1877:39. Type locality:India
Chrysomya cordieri: Seguy, 1925:303.Type locality: Sockaboemi, Java [Indonesia]
Chrysomya rufifacies: Senior-White, Aubertin&Smart, 1940:141
Chrysomya albiceps rufifacies: Kurahashi, 1971:3
Chrysomya rufifacies: James, 1977:542
Chrysomya rufifacies: Inder Singh, Kurahashi & Kano, 1979:11
Chrysomya rufifacies: Kurahashi & Thapa, 1994:224
Distribution: India, Nepal, Srilanka, South China, Thailand, Malaysia(Malaya,Borneo),Singapore,Indonesia (Java,Maluku), Philippines; Palaearctic region: China, Korea, Japan. Australian & Oceanian regions: Guam, Marshall Islands, Hawaii Islands, Indonesia, PNG, Vanuatu, New Caledonia, Fiji & Australia.

Bionomics:

Larvae of this fly are commonly known as 'hairy' maggots as the first and seventh abdominal segments bear several pairs of finger-like papillae. They are predacious in nature and attack other larvae of Calliphoridae, Sarcophagidae and Muscidae found in the same breeding place (Kurahashi et al., 1997; Bharti & Singh, 2003). This species is known to be involved in secondary myiasis.

***Chrysomya bezziana* Villeneuve,1914**

Chrysomya bezziana Villeneuve, 1914: 430. Type locality: Africa
Chrysomya bezziana: Kurahashi, 1971:3
Chrysomya bezziana: James, 1977: 541
Distribution: India; widely distributed in the oriental region, including New Guinea (Irian Jaya & PNG) and Bismarck Arch.

Bionomics:

This species is commonly known as "Old World screw-worm" fly. It is an obligate parasite (specific myiasis producing flies) and unlike Chrysomya megacephala and Chrysomya rufifacies never breeds in the dead bodies of animals. The larvae are commonly found in many diseased tissues and organs of the human body and particularly in the nose and accessory sinuses. These flies generally oviposit on fresh wounds and are attracted by smell of blood, but never deposit its egg or larvae on the unbroken skin. Eye infestation has been reported by number of scientists (Patton, 1922; Zumpt, 1965; Greenberg, 1971, 1973). C. bezziana is one of the most important producers of myiasis in man and domestic animals in the

old World tropical countries (Spradbery & Vanniasingham, 1980; Zahedi & Jeffery, 1982; Bakar et al., 1983; Vellayan et al., 1984).

***Calliphora pattoni* Aubertin,1931**

Calliphora pattoni: Aubertin, 1931. Ann. Mag. Nat. Hist., (10)8:615

Calliphora pattoni: Tumrasvin, Kurahashi and Kano, 1976, Bull. Tokyo Med. Dent. Univ., 23: 211-216. Type locality: India, Darjeeling

Distribution: India (West Bengal), Nepal, Thailand, Burma and Taiwan.

Bionomics:

This species is usually found in evergreen forests, alpine flowers and few flies are found on garbage piles around human dwellings. According to Senior-White et al., 1940 this species is larviparous. The fly is responsible for transmission of various bacteria for bacillary dysentery, typhoid fever and other salmonelloses, poliomyelitis etc. and for causing facultative myiasis.

***Calliphora vomitoria* (Linnaeus,1758)**

Musca vomitoria: Linnaeus, 1758:595. Type locality: Sweden

Calliphora vomitoria: James, 1964: 171

Distribution: Cosmopolitan, widespread in Palaearctic region: Canary Islands, Eurasia, Afghanistan, India, Nepal, Mongolia, China, Korea and Japan. Australasian and Oceanian regions: Hawaiian Islands, Australia, New Zealand. Widespread in Nearctic and Neotropical regions.

Bionomics:

Adults are commonly found in mountainous areas up to 3800m. Males are frequently found in evergreen forests, but females are abundant on human faeces, garbage piles, and decomposed materials around human dwellings. This fly is responsible for transmitting bacillary dysentery, typhoid fever, poliomyelitis etc.

***Lucilia sericata* (Meigen,1826)**

Musca sericata: Meigen, Sitz. Beschr. V, p.53, 1826

Lucilia basalis: Macquart, Mem. Soc. Royal Agric. Arts, Lille, p.305, 1842

Lucilia flavipennis Macquart (nec.kram.), Mem. Soc. Roy. Agric. Arts, Lille, P.296, 1842; id., Kipt. Exot. iii, p.139, 1842

Musca lagyra: Walker., List. Dipt. Brit. Mus. IV, p.885, 1849

Lucilia barberi: Townsend, Smiths. Misc. Li, p.121, 1908

*Lucilia girault*i: Townsend, smiths. Misc. Li. P.121, 1908

Type locality: Europe

Distribution: Cosmopolitan.

Bionomics:

There is a large amount of literature on this insect in connection with its habit of 'blowing' sheep (i.e. to lay eggs). Much investigatory works has also been done on its physio – chemical ecology. In temperate climates the fly is comparatively harmless, but in Africa and Australia it is one of the species most intimately connected with the blowing of wool, and is a serious pest (Senior White et al., 1940). Larvae are usually scavengers but frequently invade the injured human tissue. In most instances the damages produced by these larvae are traumatic, such as extension of the pre-existing wounds (Kurahashi, 1997).

***Lucilia illustris* (Meigen,1826)**

Musca illustris: Meigen, Sitz. Beschr. V, p.54, 1826

Musca parvula: Meigen , Sitz. Beschr. V, p.55, 1826

Musca equestris: Meigen, Sitz. Beschr. V, p.57, 1826

Lucilia lepida: Robineau –Desvoidy, Myodaires, p.453, 1830
Lucilia fraternal: Maquart, ibid.
Musca muralis: Walker, List Dipt. Brit. Museum
Lucilia Caesar: Hough (necl.) Zool. Bull. P.288, 1899;
Townsend (necl.), Ann. Ent. Soc. Amer. xxi, p.121, 1928.
Type locality: Europe
Distribution: India (Himalaya), Burma, China, North America.

Bionomics:
This species is responsible for causing enteric myiasis in man. Generally inhabits filthy places and therefore carries pathogenic organisms to human food such as polio virus. Sterile larvae of this species and of Lucilia sericata are used in maggot debridement therapy (MDT) for curing wounds.

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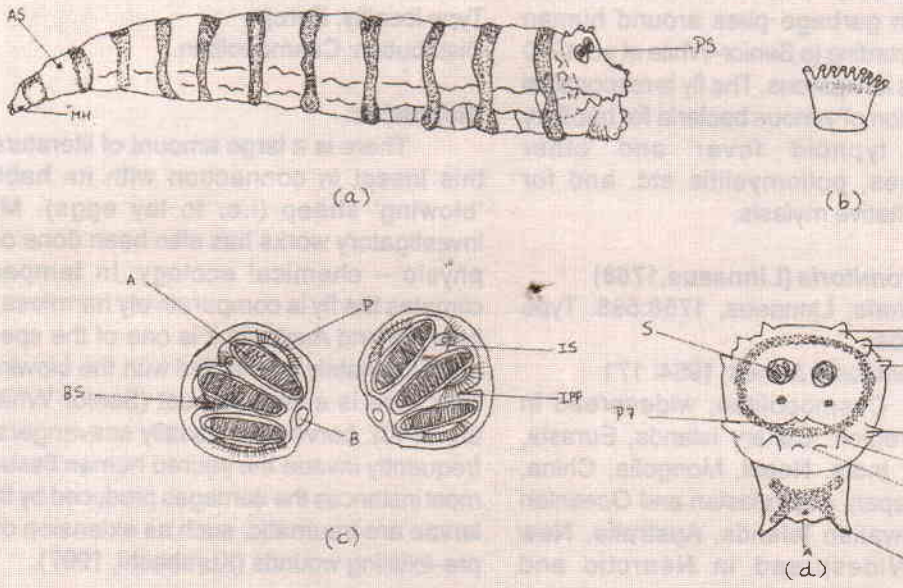

Fig: 1. Morphology of generalized third instar larva. a, entire larva (AS,Anterior spiracle; MH, mouth hooks; PS, posterior spiracle); b, anterior spiracle; c, posterior spiracles (A, aperture of slit; B, button; BS, blister structure; IPP, internal peritremal projection; IS, intermediate structure; P,peritreme); d, posterior view of 12thy segment of third instar larva (A, anus; AL, anal lobe; P1-p7, posterior papillae; S, posterior spiracle)

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